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Management of Arid Grazing Lands

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by

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INTRODUCTION

A three-member delegation on management of arid grazing lands participated in technical and scientific exchange activities in the People's Republic of China from July 18 to August 16, 1982. The exchange was sponsored by the Ministry of Agriculture, Animal Husbandry and Fisheries of the People's Republic of China, and the USDA Office of International Cooperation and Development.

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The activities were centered around management of arid grazing lands in the areas of:

range and pasture management and forage production systems on arid grazing lands;

soil/climate/vegetation relationships, soil erosion, conservation practices and programs;

range and pasture forage quality, animal nutrition, range livestock health restoration, and livestock production and production systems;

plant materials for range conservation, restoration and livestock production.

We began our discussion in Beijing on July 18 and then proceeded to five principal sites for exchange of information on grazing lands. These included state farms near Hailear, Tong Liao, Baotou, Xilin Hot, and Hohe Hot. Our comments, conclusions, and recommendations are noted in the narrative and generally center on the following:

1. There is a need for additional basic resource information on soils and range sites;

2. There is a need for grazing or range management plans that can be used at all levels, but particularly at the subfarm (local) level;

3. The nutritional needs of livestock need to be more prominent in decisionmaking;

4. More local experimentation and observation of plants should be initiated; for example, exclosures in rangelands to show the potential of these lands could be initiated;

5. More information should be gathered with the goal of rangelands improvement, before large-scale mechanical treatment of rangelands is undertaken;

6. Plant materials that could be evaluated in the United States are Elymus Chinense and Stipa grandis. A search of the literature on the use of these plants in the northern United States and Canada could be useful.

OBSERVATIONS AND RECOMMENDATIONS - SOILS

1. Soils are generally low in nitrogen.

2. Insufficient nitrogen (organic and inorganic) is supplied.

3. Alfalfa is not inoculated with nitrogen fixing microorganisms.

4. There are plans to disturb large areas of native grass to increase vigor of native range.

5. Large areas of sandy soils are plowed for tree (shelterbelt) planting.

6. Land leveling is underway for surface irrigation even though center-pivotal systems are being used.

7. The sandy soils (sand lands) when disturbed must be covered with plant material as soon as possible to protect against the strong, dry spring winds.

8. Legumes introduced into the cropping system should be planted in strips with small bands of adjacent native grass left uncut to protect the disturbed soil until the legumes are established.

9. Some landleveling for basin irrigation is not adequate and large pools of water were standing several days after irrigation water was removed.

10. Water is left for one week in some basin irrigation schemes which appears to be longer than required to wet the soils.

11. Soils data presented were for the plow layer, 0 - 10 cm. No other data were available. Sampling and analysis of the soils should be to a depth of 150 cm.

12. Some farms lacked soil survey maps to show soil and range site distribution. The soils and plant communities should be mapped at a scale suitable to permit interpretations for range and crop management.

13. A soil and plant tissue testing program should be initiated.

AGRICULTURE AND ANIMAL HUSBANDRY STATE FARMS OF INNER MONGOLIA

There are 126 agriculture and animal husbandry farms in Inner Mongolia distributed in 7 alliances (prefectures) and 3 municipalities. The Hulanbi Alliance, with headquarters at Hailear, has 21 farms; Tong Liao, 19 farms; and Xilin Hot, 12 farms. The General Administration Bureau of the Agriculture and Animal Husbandry State Farms located in Hohe Hot administers 60 million mu (4 million hectares) of the 1 billion mu (66,666,667 hectares) of grazing land in Inner Mongolia.

The pasture lands (native rangeland) are divided into four classes: 1 - woodland, 2 - typical grassland (Hailear is an example), 3 - semi-desert (Tong Liao is an example), and 4 - desert. Precipitation means and yields of grass from the various classes are as follows: desert, 100 mm per year, 375 kg per ha; semi-desert, 100-200 mm per year, 750 kg per ha; typical grassland, 300 mm per year, 750 kg per ha; and woodland, less than 400 mm per year, 2,250 kg per ha.

Soils of the typical grassland are dark Castanozems and Chernozems (Borolls) and brown and gray desert soils (Aridisols and Borollic Intergrades). The dark chestnut soils have dark surface soils (Mollic epipedons) 35 to 55 cm thick, 3 to 5 percent organic carbon with a calcium carbonate accumulation (7 to 35 percent CaCo3) at the 35 to 60 cm depth. Castanozems (Mollisols and Psamments) occupy 50 percent of the grassland of Inner Mongolia; Chernozems (Mollisols) occupy 14 percent; Brown soils (Aridisols and Borollic Intergrades) 13 percent; and gray-desert soils (Aridisols) 25 percent.

The climate of Inner Mongolia is semi-arid continental with cold winters. Extremes at Hailear, 49° north latitude are -49° C and 40° C and a mean annual temperature of -2.4° C and a frost-free period of 95 days. At Tong Liao, 44° north latitude, the mean annual temperature is 5.6° C and 143 frost-free days. At Xilin Hot, 44° north latitude and 1,000 to 1,400 meters above sea level, the mean annual temperature is -0.2° C with only 79 frost-free days. The mean annual precipitation was reported to be about 350 mm with about 200 mm falling in July and August. April, May, and June are dry and windy.

Animals under the control of the General Administration Bureau include 200,000 cattle, 110,000 horses, 10,000 donkeys, 5,000 mules, 3,000 camels, 15,100 goats, and 1,021,000 sheep.

In all of Inner Mongolia in 1981, there were 3,547,000 cows; 1,787,000 horses; 740,000 mules, 380,000 camels, 19,580,000 sheep; 7,110,000 goats -- a total of 33,448,000 animals.

XUER TALA ANIMAL HUSBANDRY FARM
HAILEAR, INNER MONGOLIA

This farm was established in 1955 for the breeding of CANHE cattle, a dual purpose breed, and to furnish meat and milk to the state. This farm is located in the center of the Hailear area at 49°, 20' north latitude, with a continental climate, the temperature ranging from a high of 40° C to a low of -49° C with a mean annual air temperature of -2.4° C and a frost-free period of 95 days. Precipitation averages about 325 mm annually with about two-thirds coming in July and August. Spring season is dry. The farm, called "no water animal farm," occupies the second terrace of the Hailear River, on an undulating surface 630 to 670 meters above sea level. Soils are dark Chestnut, Chernozems (Borolls) and Meadow soils (Aquolls) near the river. The grasslands are dominated by Stipa klemenzii, Elymus chinense, Koeleria crista, and Agropyron cristatum. The water table on the second terrace is about 100 meters below surface.

The area of the farm is 850 square kilometers (about 84,700 hectares). Of this, 11,333 hectares are used for feed and food crops; 14,300 hectares are used for pasture; 31,385 hectares are cut for hay; 10,000 hectares are used for buildings, roads, and other cultural features; the remainder are wet, sandy, or stony, and considered wasteland.

The total number of animals on the farm is reported to be 6,460; cattle numbers are 3,800 of which 1,286 are dairy animals; 1,017 horses, of which 165 are brood mares; and 425 sheep. The remainder are probably calves and young cattle up to three years of age, which is the usual market age, we were informed. The goal is to improve the pasture to a carrying capacity of 10,000 head of cattle.

The administrative arrangement of this farm consists of 19 production brigades as follows:

Dairy cattle	7
Agriculture	4
Combination animal husbandry and agriculture	1
Processing plant	1
Breeding station	1
Capital construction	1
Forestry station	1
Range improvement	1
Tractor repair shop	1
Vehicle transportation	1

Equipment includes:

Tractors	37
Rubber-tired trucks	40
Cars and Trucks	19
Combines	36
Swathers (15 imports)	20

There are 1,029 households, 2,079 staff, and 5,564 people on the farm. The farm is essentially self-sufficient for food. It provided to the state last year 2,500 tonnes of grain, 2,100 tonnes of milk, 650 cows for meat, and 133 horses. The staff members received 340,000 yuan in bonuses.

The rangeland on the Xuer Tala State Farm is a nearly continuous sod composed of rhizomatous and bunchgrasses with about 10 to 15 percent forbs in the stand. The number of range sites is unknown and range condition is difficult to assess, but was judged to be between high fair and high good. The director indicated that he perceived that 180,000 mu were declining in production. Yield was said to range from 70 to 130 catty per mu.* Peak standing crop, in our judgment, was between 1,500 and 2,500 lbs. per acre on most of the range we viewed.

Presently, 3,800 head of cattle grazed this area of which 1,286 are milking dairy cattle. The area also supports 1,017 head of horses of which 165 head make up the breeding herd.

For the most part, dairy cattle are dependent upon headquarter's supply of water. They return to the headquarters to be milked three times a day. Therefore, they are probably not herded more than two kilometers from the water and milking facilities. Some animals may be milked on the range. The total number of animal unit days of grazing and the length of grazing season are unknown. We judge that the dairy cattle begin grazing about the middle of May and graze to the middle of October. Horses probably graze the area much longer and stay on the range except for periods of deep snow.

This rangeland could be expected to respond dramatically to grazing and haying management. Simple deferred rotation systems may be adequate, but first the potential and current status of the rangelands must be documented. Management goals must be stated. A sample haying plan within various regions of the farm might be as follows, where the month represents the time of cutting:

Year	Area (1)	Area (2)	Area (3)
1	Cut in August	Cut in June	Cut in July
2	Cut in July	Cut in August	Cut in June
3	Cut in June	Cut in July	Cut in August
4	Cut in August	Cut in June	Cut in July

A significant response would be expected from this plan by the end of one cycle. Some criteria must be established to measure success, for example, changes in productivity, or species composition. A similar deferment (with as few as two areas) could be used on the grazed areas.

Total livestock numbers and their production requirements must be kept in balance with the hay supply and carrying capacity of the summer grazing area. Removing natural grassland for agronomic purposes and increasing the cutting area to produce hay may result in inadequate area for grazing.

*See conversion table for U.S. equivalents.

The number of horses in relation to cows and the season of use by each should be considered. Cows need high quality grazing and hay for milk production. Horses utilize lower quality forage more efficiently than cattle, provided the amount of forage is not limited. Horses eat more than cows; therefore, if cows are allocated 10 mu per month, horses should be allocated 13 to 15 mu per month.

Following are some suggestions:

(1) Develop a complete inventory of the soils and vegetation of the Xuer Tala Agriculture and Animal Husbandry Farm. Determine the production status in relation to the potential and stated goals.

(2) Restore productivity of the natural grassland through proper grazing management. Such management would include proper season of use, proper numbers of animals, and proper distribution of animals.

Restoration of vigor would occur because of (a) improved health and vigor of the plants, and (b) changes in plant species composition to more desirable mix.

(3) Develop adequate livestock water on the unwatered portions of the range using a few deep bore wells, a storage facility and pipeline distribution system. Make sure water is properly located and the supply of water to an area can be regulated. Therefore, land that is now cut for hay would be grazed.

(4) Develop alternative sources of winter feed, such as, alfalfa hay, silage, or haylage.

(5) Provide proper nutrition to animals including crude protein, energy, minerals (especially phosporus) and vitamin A.

(6) Alter the goal to production versus numbers. Maximum production occurs at less than maximum numbers of animals.

We do NOT recommend mechanical treatment of the soil to restore the natural grassland. Plowing may result in short-term increase in mineralization and release of nitrogen, but long-term reduction in organic matter may occur. Further, plowed areas must be fenced and managed separately. Because phenology of the plants is changed, palatability will usually be lower than surrounding grassland.

We do NOT recommend supplemental irrigation of natural grassland. Little additional productivity can be expected. Negative aspects include species composition shifts, increase in weedy species, increased weedy seed load in the soil, increased chance of plant disease, and insect and rodent outbreaks.

Rodents are seldom a problem on properly managed rangeland. Occasionally natural outbreaks do occur. The economics of trying to control these natural outbreaks is questionable.

Although a continuous supply of milk has marketing advantages, more profit might be realized by carefully matching the requirements of the

milking cow to nutrients available in natural grassland and harvested forages. We would recommend, for example, changing the breeding season from year-round to two distinct 90-day seasons. One to produce calves in the spring and one in the fall. By concentrating herd management, more effective breeding and culling procedures could be implemented. It is difficult to compare the milk production of cows that calve at different times of the year as it is difficult to separate genetic from environmental influence.

More attention must be given to meeting the nutritional requirements of milking and growing animals in relation to their genetic potential, especially during the dormant/winter season.

Fall and winter management of the horse herd should be considered. Milk production of mares declines rapidly as forage quality declines in late summer and fall. The diets of young, growing animals must be supplemented with high quality forage and/or concentrates in order to assure healthy, sound animals.

MUER GANG HUR SUMMER FARM

As an adjunct to our visit in Hailear, we spent one day traveling 75 miles north to the grazing lands used by a number of communes. Over 300,000 head of livestock are concentrated here during a brief summer grazing period. One of the communes using the land is the Bayin Hada People's Commune. This commune has five production brigades which encompass 300 households and 1,400 people. The labor force is about 300 with 44,000 animals, which use 11,000 square kilometers of land in this summer farm. Each household has 1,400 sheep or 500 horses or 150 cattle. There are four herdsmen for each herd. Income is derived from selling products above the assigned goal. The grazing was along the floodplain of a tributary of the Muer Gang Hur (river). The Hailear and Imi Rivers join a few kilometers north of Hailear to form the Muer Gang Hur. The small tributary along which we traveled has many meanders. These were visible from the roadway. Numerous herds of cattle and horses, as well as numerous bands of sheep, graze in close proximity to the stream.

ZHU RIHE AGRICULTURE AND ANIMAL HUSBANDRY STATE FARM
TONG LIAO, INNER MONGOLIA

This farm was established in 1955 and had an initial staff of 66 and 2,454 head of animals, providing meat, milk, and wool. This farm now has a staff of 3,071 (90 percent are Mongolian) and 55,640 head of animals.

This farm is located at 43° 59' north latitude where the climate is continental with a mean annual air temperature of 5.6° C. The temperature extremes range from 41° C to -33° C with a frost-free period of 143 days (with a range of 124-161 days). Precipitation averages 355 mm per year with a maximum during June through August. The winds are from the south in the summer and northwest in the winter. The farm is well watered with the Sinkai River along the southern part and the Wuli ji Murin River in the center of the farm. There are 12 natural ponds with 850 hectares of water surface.

The area of the farm is 1,336 square kilometers (160,000 hectares) and comprises the undulating hills and sand dunes on the northwest to southeast sloping grasslands south of a mountain range. Altitudes range from 190 to 334 meters above sea level. The topography is classed as (1) slightly undulating, 27,870 hectares; (2) sand land and sand dunes, 30,870 hectares; (3) slightly undulating and flat, 35,200 hectares; and (4) alluvial and meadow lands, 32,870 hectares. The soils are Udipsamments, Quartzipsamments and Borolls on the sand lands and dunes and along the rivers are silty Borolls. Land use is as follows: cultivated crops (agriculture), 20,700 hectares; and natural grasslands (grazing), 126,700 hectares. Most of the grazing land on this farm is found in the sands and sandy type range sites. Most of the dunes are "stabilized" and many resemble U.S. choppy range sites. The depth to the water table is shallow and water loving species such as Salix are found widely distributed throughout the farm. Some extensive areas have a savanna of Chinese Elm trees.

Acreage and yields of grass are as follows: (1) alluvial grasslands, 47,000 hectares, 2,655 kg per ha; (2) low lying, wet, saline meadows, 3,670 hectares, 2,085 kg per ha; (3) sandy land and sand dunes, 64,300 hectares, 1,575 kg per ha and gentle sloping uplands, 11,000 hectares 1,965 kg per ha. There are 1,670 hectares of forest, 1,730 hectares of cultivated crops (agriculture), and 670 hectares of planted grass. At present, there are 55,640 head of animals -- 33,163 cattle, 10,037 sheep ,5,269 goats, 5,474 horses, 621 donkeys, 92 mules, 84 camels ,66 deer, and 500 pigs. Of the 33,163 head of cattle, 3,000 are used for milking and the rest are calves, yearlings, and two- and three-year olds. Animals are sold to the state as three-year olds. Milk production on this farm is seasonal.

There are now 9,800 people on the farm in 1,800 households. It is organized around 7 branches and 18 production brigades. The farm has 18 primary schools, 2 middle schools and 1 high school. It also has resident doctors and hospitals. There are 55 tractors, 19 cars and trucks, and 1,600 square meters of permanent sheds for animals.

Since the farm was established, the following items have been provided to the state: 104,000 cattle and sheep; 11,000 head of horses; 13,500,000 kilograms of milk; 3,500 kilograms of wool, and 350 catty of milk powder. The profits over this period were 2 million yuan (1.96 yuan equals about U.S. $1.

INVENTORY OF NATURAL RESOURCES

The team recommends that this state farm place high priority on developing a detailed map of the soils and range sites found on this farm. Information must be gathered on the way vegetation on each site responds to grazing. Measurements would include successional response of various plants to absence (or intensity) of grazing and productivity.

GRAZING AND HAYING MANAGEMENT

Upon evaluation of the resource, a grazing management plan should be developed to insure proper stocking rates to sustain the natural resource while balancing the forage supply and animal requirements. Removal of grazing land for agronomic crop production and fallowing of the natural grassland for additional hay has placed pressure on the summer grazing area. Much of the area that is grazed in summer is in the semi-stable dunes area which should only be grazed lightly in late fall and winter.

It appears that the stocking rate exceeds the carrying capacity of the land. Range condition ranges from poor to good, depending upon the distance from water. In order to optimally utilize the range resource on the ZHU RIHE Agriculture and Animal Husbandry Farm, water resources must be developed to provide adequate water for animals at all times.

Further, the system needs to be developed in such a way that the manager has control over the water resource. In this way, the herder can use the water to control the season of use for any range area.

It might be possible to lower the present stocking rate without impacting greatly the overall productivity of the farm. First, the management should reevaluate the mix of animals on the farm. It is not known if the current animal mix is optimal. Unproductive animals should be culled from the herd. Animals should be marketed at one-and-a-half to two years of age. In order to accomplish this, the winter nutrition program must be improved. Conception rate of cows could probably be increased by improving the nutrition of the herd and supplementing the forage with phosporus and vitamin A in late summer and throughout the winter. This suggestion applies to cattle, sheep, goats, and horses. Other animals may also be deficient in these nutrients. Because horses eat more than cows, and typically have a longer grazing season, any reduction in horse numbers would be of great benefit. Horses compete directly with cattle for forage on the range.

Alternative crops such as alfalfa hay should be developed to provide higher quality hay throughout the winter. By developing such a source of winter feed, fewer acres of natural grassland would need to be cut. In order to assure optimal productivity of the natural grassland cut for hay, a haying schedule should be developed. Presently, natural grassland hay is cut in late August and September. Hay cut at this time of the year will be quite low in crude protein, phosporus, available energy, and vitamin A. The haying schedule would allow hay to be cut earlier in the year to provide nutrients for higher animal performance. Maximum use should be made of other crop residues. Often such residues can be supplemented with a small amount of alfalfa hay, concentrates and oilseed meal to extend the hay supply. We highly recommend analysis of the winter feed supply in order to assure proper supplementation for optimal animal production.

CHA JIN TAI AGRICULTURE AND ANIMAL HUSBANDRY FARM
TONG LIAO, INNER MONGOLIA

This farm occupies sand land and sand dunes. It was established in 1960. The precipitation ranges from 350 to 450 mm per year with most coming in July and August. The farm covers 20,667 hectares. There are 6,500 head of sheep of which 2,000 are ewes; lamb survival is about 80 percent. There are 3,200 total cattle with a 1,000-head breeding herd. There are 700 horses of which 200 are brood mares. Of the 18,700 hectares used for agriculture and animal husbandry, 1,670 hectares are cut for hay.

The farm has 10 production brigades each with 150 to 250 people. Each has two specialists, depending on the items produced. Each brigade engaged in animal production has two veterinarians. There are shops, schools and hospitals on the farm. They are self-sufficient as far as food is concerned. Data for this farm was limited.

The low lamb crops (80 percent) and the low calf crops (70 percent) show that both range and animal management could be improved. Management indicated that they allowed 10 mu per year per sheep and 50 mu per year for horses and cattle. The goal was to increase the carrying capacity by 30 percent by 1990. Because of the uncertainty of the definition of a sheep and a cow and a horse, the reasonableness of these stocking rates and state goal is difficult to judge. However, previous experience with similar vegetation types leads us to estimate that 130 to 150 mu would be required to support a cow for one year. Because horses eat more than cows, even greater allowance must be made for these animals (perhaps 150 mu per mare). Sheep might require 30 to 50 mu. The stated goal of increasing the stocking rate by 30 percent by 1990 is not realistic unless most of the winter feed supply is made up from other sources.

In order to improve the conception rates of female animals on the farm, the winter nutrition program must be enhanced, while simultaneously reducing the stocking rate on the remaining land during the grazing season. The hay which is being fed to the animals during the winter is probably deficient in crude protein, phosporus, vitamin A, and digestible energy, especially for growing or producing animals.

This farm has a small grazing system set up for dairy cattle. It includes six pastures that are included in a rotation grazing system. The cattle are black and white Canhe dairy cattle.

HUANGHE (YELLOW RIVER) DAIRY FARM
AT BAOTOU, INNER MONGOLIA

This farm is situated in the southwest suburbs of Baotou City and is bounded on the south by the Huanghe (Yellow River), on the east by Red Flag State Farm, and on the north by the Machi People's Commune. Fresh milk production is the main goal.

Mean annual air temperature is 6° C and the mean annual precipitation is 333 mm with a range of 200 mm to 678 mm with about 200 mm falling in July and August. Spring and autumn are the windy seasons. The soils are sandy with increasing silt in the fields near the Yellow River. An irrigation canal 4 kilometers long was completed in 1966. Water is pumped directly into the canal from the Yellow River by two pumps mounted on a barge. The pump capacity is 3,500 gallons (13,458 liters) per minute.

The farm is a slightly undulating floodplain and some attempts to level 533 hectares for irrigation have been made. There are 3,600 hectares of which 800 hectares are considered arable, 530 hectares are in natural grassland, and 133 hectares are woodland. Of 780 cows, 500 are milking and the herd average is 5,240 kilograms per cow on three-times-a-day milking.

The farm is organized into production units as follows: grassland, animal husbandry, forestry, forage, brick and tile kiln, winery, milk production, pastureland, vehicle transport, milk marketing, and millet and wheat processing plant. These units are equivalent to a production brigade elsewhere.

There are 4,000 people with a staff of 1,810, two medical clinics, one middle school and two primary schools. The profits on this farm were 210,000 yuan in 1981.

Grass hay is cut from approximately 8,000 mu of natural grassland which is irrigated by a controlled flood and dike system near the Yellow River. The hay is cut in September. One analysis showed the crude protein content to be 5.2 percent. The hay which we looked at would probably have been between three and five percent crude protein. Because of the nature of the grass, the hay was obviously too low in available energy to be used for efficient milk production. We would judge that grinding the hay did increase intake by the dairy cows, and consequently enhance its value. Furthermore, the hay was mixed 90:10 with oil and fish meal, as well as brewers' products and barley. At any rate, feeding this hay to milking or growing animals is inefficient.

Two suggestions are in order: (1) Institute a system of controlled irrigation and cut the grass early. The regrowth and aftermath of this cutting could be grazed by nonlactating animals in the early fall. (2) Use an alternative hay such as alfalfa. Alfalfa hay cut prior to one-tenth bloom is a good source of protein and energy for producing animals. (One-tenth bloom is defined as that time when one-tenth of the flowers on a raceme have developed petals; not, when approximately one-tenth of the racemes in the field have flowers).

We would also recommend that the farm experiment with cutting the corn silage at a later date in order to increase its grain content even if the silage needs to be reconstituted because of low dry matter content. Furthermore, one of the advantages of producing alfalfa is that it can also be prepared as either silage (30 percent dry matter) or haylage (45 percent dry matter).

The irrigation system should be evaluated by irrigation specialists to get a more precise irrigation plan for the application of water and to evaluate the drainage. Alternative species should be considered.

There were areas of sandy loam soils in this state farm that appeared to be well suited for irrigation and alternate forage species, e.g., alfalfa.

BAIINSILE LIVESTOCK FARM
XILIN HOT, INNER MONGOLIA

The farm is located between 43° -26' and 44° -08' north latitude and 116°-04' and 117-05' east longitude and is transected by the Xilin River. High sand hills and sand plains on the north and extinct volcanoes and basalt flows on the south form the topography. These general areas are interspersed with wide valleys, with high water tables. A lake about 1½ meters deep occupying about 20 hectares among the sand hills represents the water table of the general area. Populus, Picea, Salix, Ulmus, and Betula species occur on the steppe and on north slopes of the sand ridges. Most of the ridges are stabilized. (The occurrence of Picea, Salix, and Betula on steep sand hills is unique to the experience of the team.)

Altitudes range from 1,000 to 1,400 meters. The mean annual temperature is -0.2 C and the mean annual precipitation is 350 mm with 52 percent falling in July and August. Frost-free days are 79. The area of the farm is 3,579 square kilometers, (96 percent of the area is in native range); 212,000 mu (14,000 hectares) is cultivated on a fallow rotation system. There are 6,000 hectares of sparse woodlands. There are 12,900 people of which 4,300 are staff. The remainder are senior citizens and children.

There are 12 subfarms, each equivalent to a production brigade on other farms. There are 40 production teams - 11 for agriculture and 29 for animal husbandry.

There are 9 units for industry and side-occupations:

(1) Woolen textile and leather
(2) Food processing plant (under construction)
(3) Cement mill with 500 tons per year capacity
(4) Flour mill with 3,000 tons per year capacity
(5) Engineering, roads, building construction
(6) Agriculture implement repair
(7) Forest nursery
(8) Range establishment team, irrigation and fencing
(9) Food processing plant and a milk processing plant (under construction)

Agricultural implements include 63 trucks, 88 tractors, half of which are track vehicles, 35 combines, and 105 mowers. For livestock numbers, see the table on the next page.

The farm has a 60-bed hospital with 17 doctors and 23 nurses. There are one or two doctors at each subfarm clinic. There are 15 primary schools, 6 middle schools, and 1 high middle school. The faculty numbers 210. There are 3,640 students in primary and 520 in middle and high school. Some students attend higher middle school in Xilin Hot.

Over 95 percent of the land area at the Baiinsile Animal Husbandry Farm is used for livestock grazing. The soils of the area are mostly sands with a corresponding vegetation type. Two important species are Elymus

chinense and Stipa grandis. Many of the sandy areas are obviously highly subject to wind erosion. We were told that 49 percent of the total land area has "good" grass. We are not sure what that means. All of the area that we were shown has excellent grazing potential.

The 3,730 square kilometers supports a reported total of 151,000 animals of which horses and cattle make up 15 percent. Sheep predominate.

ANIMALS, BAIINSILE ANIMAL HUSBANDRY FARM

STATE FARM

Kind	Total	Male	Female	Offspring Born	Offspring Survived
Sheep	137,000	2,613	55,000	55,000	47,980
Dairy Cattle	1,020		370	274	269
Beef Cattle	4,645		1,655	1,225	1,202
Horses	8,425	279	2,298	1,631	1,599
Camel	255		105	42	42

PRIVATE RESERVE

Kind	Total	Male	Female	Offspring Born	Offspring Survived
Sheep	21,069		8,900		6,690
Cattle	2,549		1,269		658
Horses*	548				

* Used mostly for riding; few brood mares.

Reproductive performance of all animals appears to be lower than desirable. For example, the lamb crop was about 100 percent, but only 87 percent survived; the calf crop was about 74 percent based on the number of females present (not necessarily the number of females exposed); reproductive rate of horses was 70 percent.

The reason for these low production rates cannot necessarily be determined from the information that we were given. However, if we understand the situation correctly, most animals grazed a sandhills area during the winter. The sandhills area is deferred from grazing during the summer because of a lack of water. This range was in excellent condition. Furthermore, there was a good mix of vegetation including browse. There was no indication that animals were offered supplemental feed to offset the probably very low quality of this forage during the winter. Although some browsing could be expected by all animals, protein and energy content of the diets would probably be inadequate to support maintenance. Sheep diets would be deficient in crude protein,

phosporus, possibly vitamin A and available energy. It is not known if horses also winter in this area. If they do, diets would be deficient in crude protein, phosporus, vitamin A, available energy and possibly some of the vitamin B complex. Camel diets would be low in energy. Hay cut after the first part of August is probably deficient in crude protein, phosporus, vitamin A, and energy to meet the requirements of lactating animals. It is recommended that hay cut after that time be used only for maintenance diets.

Stocking rates on this rangeland should be carefully determined and controlled. A complete soils inventory and correlation with range sites is needed in order to balance the productivity of the area with the number of animals. Furthermore, this would facilitate development of the correct balance of animals on the area. (Horses and cattle should not be considered as equivalent animal units on these grazing lands. Horses consume much more forage than cows, up to 1.5 times, and compete directly in time and space with cattle for forage resources). It is our judgment that this area is better cattle range than sheep range. In order to assure the correct number of animals on this large grazing area, two management options must be included: (1) Flexibility must be built into the operation so that numbers may be reduced quickly in case of drought, (2) A system of reserve forage should be developed in order to reduce the stocking density during periods of low available forage.

Because of the few number of widely spaced watering points, animal distribution on these rangelands is poor. Areas near the water holes are declining in productivity while areas at greater distances from the water holes are virtually unused. Either new watering sites must be engineered or the number of animals must be reduced in order to prevent reduction in productivity of the areas close to water. Some of this problem could be alleviated by controlling the use of animals near a given water source and thereby implementing a deferred (fallow) system of rotating the use over the entire range area.

On this farm, considerations for alternative sources of feed for the winter should be made. Alternative feed/forages (such as alfalfa) may be more cost-effective in wintering weaned calves than concentrate feeds.

It was discovered late in our investigations that there is apparently unlimited growth of the private reserve herds on this state farm. For example, it was noted on the Baiinsile farm that almost 15 percent of the total animals on the farm were private reserve animals. There appeared to be no policy to limit the growth of these herds. All of the rangeland that we saw was at or near carrying capacity without additional development to improve the distribution of the grazing animals. The rate of growth of these private reserve herds appears to be very rapid. At this rate (possibly 10 to 20 percent per year) serious reductions in productivity of the natural grassland will occur within the next few years (as few as 3 to 5). The total number of these animals and the mix must be carefully monitored in order to insure adequate stocking rates. The ministry should have a policy statement that carrying capacity on any rangeland area cannot exceed the productivity of the area and that the range condition trend must be stable or upward. In order to do that, it is necessary to monitor the total number of animals, both state farm and private reserve.

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Mr. Yang Lianfang	Chief of Office, Foreign Affairs Bureau, Ministry of Agriculture, Animal Husbandry and Fishery

TABLE OF ORGANIZATION

National Level — Ministry of Agriculture, Animal Husbandry & Fishery

Province (Hohe Hot)
General Administration and Several Divisions
- Chief and Deputy Chief

Regional Xilin Hot
General Administration plus sections
- Director and variable number of deputy directors
- Director is equal to Deputy Chief at Hohe Hot

Local State Farm

- Baiinsile
- Head and Deputy Head

Subfarms

- Head and Deputy Head

- Production Brigades

  - Chief and Deputy Chief
  - Production teams - Chief and Deputy Chief

DISCUSSION OF THE ORGANIZATION OF THE MINISTRY OF AGRICULTURE
AUGUST 15, 1982

The following is a summary of a discussion with Yang Lianfang, Chief of the Office, Foreign Affairs Bureau, Ministry of Agriculture, Animal Husbandry and Fisheries.

In China, the government structure has been streamlined. The purpose is to simplify the organizational structure as well as to improve the working efficiency and overcome bureaucratization.

In the past, there were 14 premiers and vice-premiers on the State Council. Now the number of premiers and vice-premiers has been reduced to three.

In the past, there were 52 ministries and commissions in the State Council. Now the ministries and councils have been reduced to 41.

The Ministry of Agriculture, Animal Husbandry and Fishery, was formed through the amalgamation of two ministries and the General Aquatic Bureau. These ministries are the Ministry of State Farms and Land Reclamation and the Ministry of Agriculture.

In the past, there were 47 bureaus and departments in these three units. Now these 47 have been reduced to 19.

In the past in these three units, there were almost 2,000 staff and cadre members. This has been reduced by one-third.

The number of ministers and vice-ministers were reduced. In the past, there were 30 ministers and vice-ministers. Now there are three. The number of directors and deputy directors of bureaus have also been reduced. In the past, there were 156 directors and deputy directors of the bureaus. Now this number has been reduced to 67. (This is a reduction of 57 percent).

The average age of leading members at the ministry and bureau level has been reduced. Old members have retired or left their position. Some are engaged in research work. A few have become advisors. The work to streamline the structure is basically completed.

In the Administration of Agriculture, Animal Husbandry and Fishery, there are 19 units. These are as follows:

1. General Office

   The General Office assists the Ministry to deal with routine work.

2. Political Study Office

   This office is responsible for studying and working policies and principles of the countryside (all of China).

3. Planning Department

(It is equivalent to a bureau. It assists all 19 units).

4. Financial Department

It is in charge of agricultural money.

5. Material Department

It is responsible for supplying material for the use of agriculture.

6. Scientific and Technological Department

This department is in charge of agricultural scientific research throughout China, including fishery research.

7. Foreign Affairs Department

It is responsible for relations, technical cooperation, and friendship with other countries.

8. Education Department

It is responsible for education throughout China in the field of agriculture, including agricultural colleges and universities and special subjects in schools (including the middle schools and higher schools).

9. Propaganda Department

It is in charge of publications and information. This includes newspapers, maps, movies, and exhibitions, including Agriculture, Animal Husbandry, and Fishery.

10. Personnel Department

This department is in charge of personnel affairs in the Department of Agriculture, Animal Husbandry and Fishery.

11. Land Administration Bureau

12. Agriculture and Mechanizing Administrative Bureau

13. Administrative Bureau of State Farms and Land Reclamation

It is in charge of state farms

14. Aquatic Products Bureau

15. Administrative Bureau of Fishery Policy and Ports

16. Agriculture Bureau

    This bureau is in charge of production of agriculture -especially planting of crops.

17. Animal Husbandry Bureau

18. Commune Administrative Bureau and Production Brigade Enterprises

19. Administrative Bureau of Veteran Cadre (retired leaders)

    These people with rich experience are often listened to by the leading members.

Each of these entities has substructures or units. As an example, the Administrative Bureau of State Farms and Land Reclamation has the following structures:

1. Planning - this includes building investment
2. Science and technology
3. Education
4. Production division (agricultural production)
5. Animal husbandry
6. Material division (this group is in charge of supplies of materials and machineries)
7. Finance
8. Office of State Farms and Land Reclamation Administrative Bureau - it helps with routine affairs
9. Industrial division

There is usually one chief of a division and two deputy chiefs. There is usually a master engineer at the bureau level and also a master agronomist as staff at the bureau level. Specialists are at the same level as deputy directors at the bureau level.

The structure of agriculture and animal husbandry observed by the team is as follows:

1. Beijing - People's Republic of China - national
2. Hohe Hot - Inner Mongolia Autonomous Region - provincial
3. Xilin Hot - local
    a. Subfarm
    b. Production Brigades.

At Xilin Hot, there is an Office of General Administration. The director of Xilin Hot is equal to a chief of a division. There is a head and a deputy head of each farm. There is a head and a deputy head of each sub-farm. There is a chief and a deputy chief of each production brigade. There is a chief and deputy chief of each team. The director at Xilin Hot is equal to a deputy director at Hohe Hot.

There are over 2,000 state farms in China. They are led, either directly or indirectly, by the Administration of the Ministry of Agriculture, Animal Husbandry and Fishery. There are 5 million staff members. The population of the state farms is over 11 million. There are 238,000 enterprises involved in the state farms. The area of the state farms is over 11 million acres.

There is a basic difference between a people's commune and a state farm. A people's commune is a collective economic organization. The property and wealth belong to collective ownership. The state farms are owned by the state; that is, they are owned by everyone in China, and the profit in the state farm goes to the state. The profits in the commune will be divided by the commune itself and they pay a tax to the state. In the state farms, there are bonuses if production is good. The wages are determined by production. The average wage is about 48 yuan per month. In the commune there are no wages; everyone shares in the profits. The merit system is used in the state farms. Wages are paid according to skills. In the commune, even though there are no wages, basic living conditions are guaranteed by the state. As an example of wages, the head of a state farm draws about 90 yuan per month. The head of a large farm draws about 70 to 80 yuan per month - according to ability and skills.

ITINERARY

July	16-18	Travel from United States to People's Republic of China (Beijing)
	19-23	Beijing Orientation and Tours
	24	Travel from Beijing to Hailear
	25	Hailear Orientation
	26-27	Xuer Tala Animal Husbandry Farm
	28	Muer Gang Hur Summer Farm
	29	Hailear Lectures on range and soils by team Travel to Tong Liao
	30-August 1	Tong Liao Orientation at ZHU RIHE Agriculture and Animal Husbandry Farm
August	2	Tong Liao Cha Jin Tai Agriculture and Animal Husbandry Farm
	3-4	Travel to Hohe Hot
	5-6	Travel to Baotou Huanghe Dairy Cow State Farm Returned to Hohe Hot
	7	Hohe Hot Discussions on history of agriculture and animal husbandry farms
	8	Tour of Hohe Hot
	9	Lectures by the team
	10-12	Travel to Xilin Hot Baiinsile Livestock Farm
	13	Travel to Hohe Hot, then on to Beijing
	14	Beijing
	15	Tours Discussion with Yang Lianfang, Chief of Office, Foreign Affairs Bureau, Ministry of Agriculture, Animal Husbandry and Fishery
	16	Swenson and Rittenhouse left for the United States; Southard left for Nanjing

CONVERSION TABLE
For Use With The Narrative

Area	1 mu	=	0.1647 acres	=	0.0667 hectare
	1 acre	=	6.072 mu	=	0.4047 hectare
	1 hectare	=	15.0 mu	=	2.470 acre
Weight	1 jin (catty)	=	0.5 kg	=	1.1023 lbs.
	1 kg	=	2 jin	=	2.2046 lbs.
	1 lb.	=	0.9072 jin	=	0.4536 kg
	1 tan (shih tan)	=	0.05 metric tons	=	1.102 U.S. ton

(Standard abbreviations are used in the text).

SELECTED PLANT SPECIES LIST OF INNER MONGOLIA AUTONOMOUS REGION

Apocynum lancifolium
Agriophyllum squarrosum
Potentilla filipendula
Polygala tenufolia
Sophora flaviscens
Glycyrrhiza uralensis
Kochia sieversiana
Buphleurum chensis
Leonunus sibericus
Ephedra equisetina
Rubia cordifolia
Lepidium apetalum
Zchinops gmelinii
Polygonum divarication
Cynanchum amplexicaule
Haplophylum dauricum
Artemisia pectinata
Limonium bicolor
Artemisia frigida
Kochia prostrata
Ampelopsis japonica
Euphorbia esula
Peucedanum rigidum
Artemisia halodendron
Delphinium grandiflorum
Astragalus membranaceus
Arundinella hirta
Glycine soja
Vicia amosna
Achnastherium splendens
Beckmannia esucae formis
Miscanthus soechariflorus
Hedysarum fruiticosum
Setaria viridis
Kummerovia stipulacca
Lespedeza davurica
Caragana microphylla
Medicago lupulina
Medicago sativa
Panicum miliaceum
Cleistogenus squarrosa
Aristida adscensionis
Setaria lutescens
Digitaria isaloemusn
Hemarthria compressa
Phragmite communis
Crypsis aculeata
Tragus racemosus
Digitaria sanguinalis
Calamagrostis pseudophragmites
Stipa koeleria
Elymus agropyron
Betula platyshylla
Populus davidiana
Ulmus Panula
Salix flavida